

# Japan Geoscience Union Meeting 2011

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PEM006-01

Room:101

Time:May 25 10:45-11:05

## Current Status and Future Activities of CAWSES-II

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ICSU-SCOSTEP which promoted the STEP program (1990-1997) and the S-RAMP program (STEP-Results, Applications and Modeling Phase, 1998-2002) carried out the first international collaborative research project on CAWSES (Climate And Weather of the Sun-Earth System, 2004-2008) which examined space weather and space climate of sun-earth system in the twenty-first century. ICSU-SCOSTEP successively established an international program of the CAWSES-II (2009-2013) with an aim of significantly enhancing our understanding of the space environment and its impacts on life and society. The main functions of CAWSES-II are to help coordinate international activities in observations, modeling, and applications crucial to achieving this understanding, to involve scientists in both developed and developing countries, and to provide educational opportunities for students of all levels.

CAWSES-II is organized by the four Task Groups and other two Groups.

TG1. What are the solar influences on climate?

TG2. How will geospace respond to an altered climate?

TG3. How does short-term solar variability affect the space environment?

TG4. What is the geospace response to variable inputs from the lower atmosphere?

G5. Capacity building

G6. Science and informatics (Virtual Institute)

For the middle year (2011) of CAWSES-II, we review the current status and will discuss next activities and next action plans.

Keywords: CAWSES-II, Space Weather, Space Climate, Current Status, Next Action Plans, SCOSTEP

PEM006-02

Room:101

Time:May 25 11:05-11:25

## Japan's Contribution to the ISWI

Kiyohumi Yumoto<sup>1\*</sup>, Takahiro Obara<sup>2</sup>, Shinichi Watari<sup>3</sup>

<sup>1</sup>SERC, Kyushu University, <sup>2</sup>Japan Aerospace Exploration Agency, <sup>3</sup>NICT

In February 2010, the International Space Weather Initiative (ISWI) was proposed as a new agenda item to be addressed by the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space (COPUOS), United Nations (UN). The ISWI agenda item was endorsed by the Committee in June 2010 and by the General Assembly in October 2010. The ISWI is governed by a Steering Committee, and being supported by the United Nations, ESA, NASA, JAXA and the International Committee on Global Navigation Satellite Systems.

The objectives of ISWI are to develop the scientific insight necessary to understand the physical relationships inherent in space weather, to reconstruct and forecast near-Earth space weather and to communicate this knowledge to scientists and to the general public. This would be accomplished by (a) continuing to expand and deploy new and existing instrument arrays, following the successful practices of the IHY 2007, (b) promoting data coordination and analysis to develop predictive models using ISWI data from the instrument arrays to improve scientific knowledge and to enable future space weather prediction services and (c) continuing to promote knowledge of heliophysics through training, education and public outreach.

In Japan, the STPP (Solar Terrestrial Physics Program) subcommittee of the Science Council of Japan is participating in ISWI as a follow-on program of the IHY (2006-2009). The Chairman of the STPP subcommittee (Prof. K. Yumoto of Kyushu Univ.) and other members of the subcommittee are moving forward to newly construct Japan's programs of (a) instrument arrays, (b) data coordination and analysis, and (c) training, education and public outreach. Five instrument array programs, i.e., the Continuous H-alpha Imaging Network (CHAIN), the Global Muon Detector Network (GMDN), the Magnetic Data Acquisition System (MAGDAS), the Optical Mesosphere Thermosphere Imagers (OMTIs), and the South-East Asia Low-Latitude Ionosonde Network (SEALION) were already proposed by Dr. S. Ueno and Prof. K. Shibata, Kwasan and Hida Observatories, Kyoto Univ., Prof. K. Munakata, Shinshu Univ., Prof. K. Yumoto, Space Environment Research Center, Kyushu Univ. (SERC), Prof. K. Shiokawa, Solar-Terrestrial Environment Laboratory, Nagoya Univ. (STEL), and Dr. T. Nagatsuma, NICT, respectively. The existing databases of Solar Wind, Space Environment (satellite measurements), and Geomagnetic Field will be provided by Prof. M. Tokumaru, (STEL), Dr. T. Obara, JAXA, and Prof. T. Iyemori, WDC for Geomagnetism, Kyoto Univ., respectively, to contribute to the data coordination and analysis programs for ISWI in Japan. Public outreach will be carried out through the Network of International Space Environment Services (ISES) of NICT, (Dr. S. Watari). The ISWI Newsletter is published by SERC, Kyushu Univ. (Prof. K. Yumoto is Publisher and Mr. G. Maeda is Editor) by e-mail and mail. Distribution of the Newsletter to UN Member States is also supported through mailing system of the United Nations, Office for Outer Space Affairs (UNOOSA).

The First 2010 UN/ESA/NASA/ JAXA Workshop on ISWI was held at Helwan, Egypt, during November 06-10, 2010 for the presentation of science results from existing and future distributed observatories and their applications for prediction of space weather. Four Japanese instrument array programs, i.e., CHAIN, GMDN, MAGDAS, and OMTIs, were reported by respective project leaders. They presented their recent activities, and discussed future collaborations with the ISWI attendees of the first ISWI workshop.

In particular, SERC organized the first MAGDAS Session during the ISWI Workshop to realize 'Equal Partnership' of 'instrument provider' and 'instrument hosts'. This is the guiding principle of IHY/ISWI. The objectives of the MAGDAS Session were to frankly exchange information and opinions of MAGDAS members, and to start discussion on how we can accelerate Capacity Building.

**Keywords:** International Space Weather Initiative (ISWI), Scientific and Technical Subcommittee of the Committee on the STPP (Solar Terrestrial Physics Program), First 2010 UN/ESA/NASA/ JAXA Workshop, Capacity Building

PEM006-03

Room:101

Time:May 25 11:25-11:40

## Update on MAGDAS Activities in Africa and Around the Globe during ISWI

Kiyohumi Yumoto<sup>1\*</sup>, MAGDAS/CPMN Group<sup>1</sup>

<sup>1</sup>SERC, Kyushu University

The Space Environment Research Center (SERC), Kyushu University has deployed the MAGnetic Data Acquisition System (MAGDAS) at 54 stations along the 210- and 96-degree magnetic meridians (MM) and the magnetic Dip equator, and three FM-CW radars along the 210o MM during the International Heliophysical Year (IHY; 2005-2009) and the International Space Weather Initiative (ISWI; 2010-2012) (see <http://magdas.serc.kyushu-u.ac.jp/> and <http://magdas2.serc.kyushu-u.ac.jp/>). The deployment of MAGDAS began in Africa in the Year 2006, with installations along the dip equator in three countries. In 2008, the 96 Deg. MM Chain was established, running from Hermanus to Fayum. In 2010, a major upgrade was performed on the equatorial stations of MAGDAS. The goal of MAGDAS project is to become the most comprehensive ground-based monitoring system of the earth's magnetic field. It does not compete with space-based observation. Rather, this ground-based network complements observation from space. To properly study solar-terrestrial events, data from both are required.

This project intends to get the MAGDAS network fully operational and provide data for studies on space weather. By analyzing these new MAGDAS data, we can perform a real-time monitoring and modeling of the global (e.g. Sq, EEJ) current system and the ambient plasma mass density for understanding the electromagnetic and plasma environment changes in geospace during helio-magnetospheric storms. In order to examine the propagation mechanisms of transient disturbances, i.e., sc/si, Pi 2, and DP2, relations of ionospheric electric and magnetic fields are investigated by analyzing the MAGDAS magnetic data and the Doppler data of our FM-CW ionospheric radar.

In this paper, we will present update on MAGDAS activities in Africa and around the globe, several scientific results obtained by MAGDAS project, and a coordinated near-earth satellite and MAGDAS observations for space weather during ISWI.

**Keywords:** the MAGnetic Data Acquisition System (MAGDAS), FM-CW radar, the International Heliophysical Year, the International Space Weather Initiative

PEM006-04

Room:101

Time:May 25 11:40-12:00

## IHY to ISWI: Overview of Results from Geomagnetic Field Measurements in Africa Using MAGDAS

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<sup>1</sup>Space Physics Lab, FUTA; NASRDA, Nigeria, <sup>2</sup>SERC, Kyushu Univ, Fukuoka, Japan

From the International Heliophysical Year to International Space Weather Initiative, the Space Environment Research Centre of Kyushu University, Japan, installed 14 units of Magnetic Data Acquisition Systems MAGDAS over Africa. Magnetic records from these 14 stations have been employed in various research efforts to obtain interesting results hitherto unknown. Temporal and continental-spatial variation of Solar quiet daily Sq variation in the three geomagnetic field components H, D and Z have been investigated. H field experienced more variation within the equatorial electrojet zone. Day-to-day variability of Sq in H was examined. Twenty four (24) points analysis of numerical harmonic theory is applied to Sq in H, D and Z geomagnetic components in order to extract the amplitudes and the phase angles. A set of normalized percentage harmonics projects the influence of the contributions of each harmonic and the phase angles picture relative timing of their influence. Signature of the Equatorial electrojet over the African sector was identified and examined. The EEJ appears stronger in East than West Africa. Flow gradient does not follow a definite diurnal pattern. There is clear indication that equatorial ionosphere exhibits longitudinal variability. There exists variation in electromagnetic induction from one station to another. A call is made for continuous deployment of magnetometers in Africa.

Keywords: Geomagnetic, field, Equatorial, Electrojet, MAGDAS, Africa

PEM006-05

Room:101

Time:May 25 12:00-12:15

## Investigating the mid-latitudes extent of the ExB drift phenomenon

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<sup>1</sup>Phys. Dept., Natural. Sci., Zambia Univ., <sup>2</sup>SERC, Kyushu Univeristy

The study investigates the mid-latitude extent of the vertical ExB drift velocities and provides the feasibility of studying this phenomenon using the data from the MAGDAS at Lusaka, Zambia. Over the years our understanding of the vertical ExB drift velocities has improved with better understanding of their dynamics in the equatorial regions where the theory shows that these drift velocities are most prevalent and have the most effect, but more work remains, notably with regard to their extent toward the midlatitude regions. The study provides a comprehensive overview of the mid-latitude vertical ExB drift and suggests approaches to investigating this phenomenon in the mid-latitude sector.

Keywords: midlatitude ionosphere, ExB drift, MAGDAS

PEM006-06

Room:101

Time:May 25 12:15-12:30

## Lithosphere-Atmosphere-Ionosphere Coupling

Katsumi Hattori<sup>1\*</sup>

<sup>1</sup>Chiba University

Electromagnetic phenomena preceding large earthquakes have been reported in various frequency ranges and they are considered as candidates for the short-term precursor. ULF electromagnetic phenomena and Ionospheric anomalous changes such as GPS-TEC (Total Electron Content) are one of the most promising phenomena and they are the possible indices to monitor/forecast future crustal activities. Therefore, ULF geoelectromagnetic activities and Ionospheric changes associated with large earthquakes in Asia in this study. So far, empirical detectable distance of earthquake-related ULF anomalies is about 60 km for M6 and 100 km for M7 earthquake, respectively. For TEC anomaly, significant decreases have been reported for M>5 Taiwan earthquakes. The purpose of this study is to evaluate the reported results in Indonesia and Taiwan based on observation because they are one of the most seismically active regions in the world. We believe that our results also provide a new knowledge to upper atmosphere physics in the point view of "Lithosphere-Atmosphere-Ionosphere Coupling".

PEM006-07

Room:101

Time:May 25 12:30-12:45

## RADIATION BELT MEASUREMENTS AND DATA BASE IN JAXA

Takahiro Obara<sup>1\*</sup>

<sup>1</sup>Japan Aerospace Exploration Agency

In order to monitor space environment and its temporal variations, JAXA (Japan Aerospace Exploration Agency) Space Environment Group has been conducting space environment measurements for more than 20 years. JAXA installed space radiation detectors, magnetometers and plasma detectors on LEO (Low Earth Orbit) satellites, GEO (Geostationary Orbit) satellites, GTO (Geostationary Transfer Orbit) satellites and JEM (Japanese Experimental Module) of the ISS (International Space Station). These space environment data brought by JAXA satellites and International Space Station /Japan Experimental Module (ISS/JEM) have been used in real-time to inform warnings through the SEES (Space Environment & Effects System; <http://sees/tksc.jaxa.jp/> ) to operators of JAXA satellites as well as ISS/JEM when the space environment becomes dangerous. With these data, some distinguish achievements on radiation belt science have been obtained and an assessment of radiation belt models is under taken. Intensity of MeV electrons in the radiation belt ( $L \sim 3$  to  $L \sim 8$ ) increases by the increases of solar wind velocity as well as magnetic activities. We confirmed seasonal variation of outer belt electrons; i.e. in both spring and autumn seasons the intensity of outer belt electrons increases together with magnetic activity. This phenomenon is understood as Russell - McPherron effect. Strong injection or transportation of intermediate energy (40-100keV) electrons into the heart of outer radiation belt was identified during the magnetic storms. These intermediate energy electrons should be seeds of MeV electrons and then accelerated internally. Transport of MeV electrons into the inner radiation belt was identified; i.e. MeV electrons penetrate into the inner radiation belt across the slot region during the recovery phase of the very big magnetic storms. These penetrations will be one of the supply processes of MeV electrons in the inner radiation belt. We also identified intense precipitations of outer belt electrons into the atmosphere by means LEO satellite observations. These losses have been evident during main and recovery phases of the magnetic storms.

Keywords: Radiation Belt, Satellite Observation, Data Base

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PEM006-08

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## Global cooperation in the science of space weather

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<sup>1</sup>NASA Goddard Space Flight Center

The international space science community had recognized the importance of space weather more than a decade ago, which resulted in a number of international collaborative activities such as the Climate and Weather of the Sun Earth System (CAWSES) by SCOSTEP and the International Space Weather Initiative (ISWI). The ISWI program is a continuation of the successful International Heliophysical Year (IHY) program. These programs have brought scientists together to tackle the scientific issues behind space weather. In addition to the vast array of space instruments, ground based instruments have been deployed, which not only filled voids in data coverage, but also inducted young scientists from developing countries into the scientific community. This paper presents a summary of CAWSES and ISWI activities that promote space weather science via complementary approaches in international scientific collaborations, capacity building, and public outreach.

Keywords: Space Weather, ISWI, CAWSES, Capacity building, Gloabal Cooperation



PEM006-09

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Time:May 25 14:35-14:50

## Program of the Antarctic Syowa MST/IS Radar

Kaoru Sato<sup>1\*</sup>, Masaki Tsutsumi<sup>2</sup>, Toru Sato<sup>3</sup>, Takuji Nakamura<sup>2</sup>, Akinori Saito<sup>4</sup>, Yoshihiro Tomikawa<sup>2</sup>, Koji Nishimura<sup>2</sup>, Hisao Yamagishi<sup>2</sup>, Takashi Yamanouchi<sup>2</sup>

<sup>1</sup>U. Tokyo, <sup>2</sup>National Inst. Polar Res., <sup>3</sup>Kyoto U., <sup>4</sup>Kyoto U.

Syowa Station is one of the distinguished stations, where various atmospheric observations for research purposes by universities and institutes as well as operational observations by Japan Meteorological Agency and National Institute of Information and Communications Technology are performed continuously. National Institute of Polar Research plays a central part in the operations. The observation of the Antarctic atmosphere is important in two senses. First, it is easy to monitor weak signal of the earth climate change because contamination due to human activity is quite low. Second, there are various unique atmospheric phenomena in the Antarctic having strong signals such as katabatic flows, the ozone hole, noctilucent clouds, and auroras. The middle atmosphere is regarded as an important region to connect the troposphere and ionosphere. However, its observation is sparse and retarded in the Antarctic compared with the lower latitude regions; nevertheless the vertical coupling through the mechanisms such as momentum transport by gravity waves is especially important in the polar region.

Since 2000, we have developed an MST/IS radar to be operational in the Antarctic and have made feasibility studies including environmental tests at Syowa Station. Various significant problems have been already solved, such as treatment against low temperature and strong winds, energy saving, weight reduction, and efficient construction method. A current configuration of the planned system is a VHF (47MHz) Doppler pulse radar with an active phased array consisting of 1045 yagis.

The value of the PANSY project has been approved internationally and domestically by resolutions and recommendations from international scientific organizations such as IUGG, URSI, SPARC, SCOSTEP, and SCAR. The scientific research objectives and technical developments have been frequently discussed at international and domestic conferences and at a scientific meeting at NIPR organized by the PANSY group every year. Special and union sessions of PANSY were organized at related scientific societies such as MSJ (Meteorological Society of Japan), SGEPS (Society of Geomagnetism and Earth, Planetary and Space Sciences) and JpGU (Japan Geophysical Union) to deepen the discussion. The PANSY project was authorized as one of main observation plans for the period of JARE52-57 in 2008, and funded by Japanese government in 2009. We have started the radar construction in late December of 2010. After one year for initial test observations, MST/IS observations will be made over 12 years which covers one solar cycle.

**Keywords:** Antarctic atmosphere, gravity waves, polar stratospheric clouds, polar mesospheric clouds, atmospheric dynamics, MST/IS radar

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PEM006-10

Room:101

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## CCM simulation of the effect of solar proton events on middle atmospheric ozone: A case study of July 14-16, 2000 event

Kiyotaka Shibata<sup>1\*</sup>

<sup>1</sup>Meteorological Research Institute

Influence of large solar proton events (SPEs) is investigated with the chemistry-climate model of Meteorological Research Institute by imposing ion pair production rate profile in polar caps. An ion pair is assumed to produce 1.25 N atoms, which in turn create 0.55 N(4S) and 0.75 NO. In the case of July 14-16, 2000 SPE, it is found that ozone destruction occurs substantially in the upper stratosphere and lower mesosphere with a maximum of about 10 % at the stratopause in the northern polar cap.

Keywords: solar proton events, middle atmospheric ozone, chemistry-climate model, simulation

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PEM006-11

Room:101

Time:May 25 15:05-15:20

## CAWSESII task group 3

Kazunari Shibata<sup>1\*</sup>

<sup>1</sup>Kwasan and Hida Observatories, Kyoto U.

The purpose of the task group 3 of CAWSESII is  
to answer the question :

How does short-term solar variability affect the geospace environment?

Namely, the space weather science is the central theme of this  
task group 3.

Co-Leaders of Task Group 3 are Kazunari Shibata (Kyoto University, Japan) and  
Joseph E. Borovsky (Los Alamos National Laboratory, USA).

Recent activity of the task group 3 of CAWSESII will be reviewed.

Keywords: space weather, solar flare

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PEM006-12

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## Vortical Structures in the Magnetosphere and Ionosphere, their Relationships and Effects

Andreas Keiling<sup>1\*</sup>

<sup>1</sup>University of California-Berkeley

Vortical structures in both the ionosphere and the magnetosphere are signatures of field-aligned currents. The ionosphere supports vortical structures in various forms such as horizontal currents, plasma flows, and optical displays. The magnetosphere is known for vortical plasma flows. In this talk I will present observations from the five THEMIS spacecraft as well as the THEMIS ground network of all-sky imagers and magnetometers to demonstrate relationships and effects of such structures.

Keywords: substorm, storm, vortex, currents, magnetosphere

PEM006-13

Room:101

Time:May 25 15:40-15:55

## CAWSES-II Task Group 4: What is the geospace response to variable inputs from the lower atmosphere?

Kazuo Shiokawa<sup>1\*</sup>, Jens Oberheide<sup>2</sup>, CAWSES-II Task Group 4<sup>3</sup>

<sup>1</sup>STEL, Nagoya Univ., <sup>2</sup>Clemson University, <sup>3</sup>SCOSTEP/CAWSES-II

Studying the geospace response to variable inputs and waves from the lower atmosphere is particularly important since the induced variability competes with the solar and magnetic driving from above. Consequences for telecommunications, re-entry and satellite operations still need to be explored. The extent to which the effects of this quiescent atmospheric variability are transmitted to the magnetosphere is yet to be resolved. We thus stand right now at an exciting research frontier: understanding the cause-and-effect chain that connects tropospheric and strato-/mesospheric variability with geospace processes. CAWSES-II Task Group 4 (TG4) will therefore elucidate the dynamical coupling from the low and middle atmosphere to the geospace including the upper atmosphere, ionosphere, and magnetosphere, for various frequencies and scales, such as gravity waves, tides, and planetary waves, and for equatorial, middle, and high latitudes. Attacking the problem clearly requires a systems approach involving experimentalists, data analysts and modelers from different communities. For that purpose, the most essential part of TG4 is to encourage interactions between atmospheric scientists and plasma scientists on all occasions. TG4 newsletters are distributed to the related scientists every 3-4 months to introduce various activities of atmospheric and ionospheric researches. Five projects are established in TG4, i.e., Project 1: How do atmospheric waves connect tropospheric weather with ITM variability?, Project 2: What is the relation between atmospheric waves and ionospheric instabilities?, Project 3: How do the different types of waves interact as they propagate through the stratosphere to the ionosphere?, Project 4: How do thermospheric disturbances generated by auroral processes interact with the neutral and ionized atmosphere?, and Project 5: How do thunderstorm activities interact with the atmosphere, ionosphere and magnetosphere? Three campaign observations have been carried out in relation to the TG4 activity, i.e., stratospheric sudden warming campaign (January-February, 2010), longitudinal campaign (September 1-November 12, 2010), and CAWSES Tidal Campaign. In this presentation we show the current status and future plan of CAWSES-II TG4 activities of 2009-2013.

Keywords: atmosphere, ionosphere, gravity wave, tide, planetary wave, CAWSES-II

PEM006-14

Room:101

Time:May 25 15:55-16:15

## CAWSES-II TG 4 Longitudinal Network Campaign for investigation of atmosphere ionosphere dynamical coupling

Hisao Takahashi<sup>1\*</sup>, Jonathan J. Makela<sup>2</sup>, Kazuo Shiokawa<sup>3</sup>, Jens Oberheide<sup>4</sup>

<sup>1</sup>Instituto Nacional de Pesquisas Espaciais, <sup>2</sup>University of Illinois, <sup>3</sup>Nagoya University, <sup>4</sup>Clemson University

CAWSES-II, Task Group 4 works on the scientific objectives of geospace response to variable waves from the lower atmosphere. As one of the projects of this group, Project 2 focuses in a subject of the relation between atmospheric waves and ionospheric instabilities. In order to investigate it, we proposed to have a longitudinal network observation campaign around the equatorial and low latitude regions. The first tentative campaign has been carried out during the period of September to November (~75 days), 2010, crossing the September equinox. Ground based Ionosonde, magnetometer, MF radar, VHF radar, meteor radars and some other optical sensors have been used to collect mesosphere ionosphere related data from the different longitudes in a global scale. The campaign overview and some preliminary results will be presented and discussed.

Keywords: CAWSES-II, Task group 4, mesosphere-ionosphere coupling, longitudinal campaign

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PEM006-15

Room:101

Time:May 25 16:30-16:45

## Introduction of Various CAWSES-II / Capacity-Building Activities of Japan

Satoru UeNo<sup>1\*</sup>, Kiyohumi Yumoto<sup>2</sup>, Kazuo Makita<sup>3</sup>, Kazuoki Munakata<sup>4</sup>, Akira Mizuno<sup>5</sup>, Toshitaka Tsuda<sup>6</sup>

<sup>1</sup>Kwasan & Hida Observatories, Kyoto Univ., <sup>2</sup>SERC, Kyushu Univ., <sup>3</sup>Faculty of Engineering, Takushoku Univ., <sup>4</sup>Faculty of Science, Shinshu Univ., <sup>5</sup>STE-Lab. Nagoya Univ., <sup>6</sup>RISH, Kyoto Univ.

In this talk, we introduce various capacity-building activities of Japanese observation-network projects that have been led by Japanese domestic members of CAWSES-II Capacity-building group.

Makita et al. are promoting SARINET project whose objective is to examine the environment of the upper atmosphere in the Geomagnetic Hole (GH) around South America by using imaging Riometers (IRIS) and 1ch Riometers. They have performed cooperative research with Brazilian students of Santa Maria University and technical meetings with related universities.

Munakata et al. are promoting GMDN project in order to identify the precursory decrease of cosmic ray intensity that takes place more than one day prior to the Earth-arrival of shock driven by an interplanetary coronal mass ejection, through the cooperation with USA, Australia, Brazil, Kuwait, Armenia and Germany.

Mizuno et al. are promoting NDACC project that aim to investigate composition's change of middle atmosphere and elucidation of the mechanism by expanding lidar-observation network mainly in Argentina.

Tsuda et al. are promoting "Ground-based Atmosphere Observation Network in Equatorial Asia" in which they are doing internationally collaborated researches on the behavior of the equatorial atmosphere and ionosphere in tropical Asia by using ground-based and satellite observations, so that the scientific North-South problem will be improved.

Keywords: SCOSTEP, CAWSES-II, Capacity Building, ground-based observation network

PEM006-16

Room:101

Time:May 25 16:45-17:00

## Capacity Building of CHAIN and MAGDAS

Kiyohumi Yumoto<sup>1\*</sup>, Satoru UeNo<sup>2</sup>

<sup>1</sup>SERC, Kyushu University, <sup>2</sup>Kwasan & Hida Observatories, Kyoto Unive

Capacity Building is one of the major goals of the CAWSES-II and IHY/ISWI. In the present paper, we will introduce a good example of Capacity Building of CHAIN and MAGDAS projects. The first one is the Continuous H-alpha Imaging Network (CHAIN) project which is promoted by Kwasan & Hida Observatories of Kyoto University. They are planning to install several Flare Monitoring Telescopes all over the world in order to monitor all explosive solar phenomena continuously, because such solar phenomena are very important sources of perturbations of space weather environment. They already installed the first overseas telescope in Ica University of Peru in March 2010, and they are now preparing to install the 2nd overseas telescope in Algeria. Through the distribution of flare monitoring telescopes, they have performed various international personnel training and academic exchanges. For example, technical training of young Peruvian staff in Japan, guidance of the solar observation method in Peru, some lectures in Peru and Algeria, scientific data-analysis training for Peruvian students and young reserchers in Peru. Moreover, they held last November in Peru a science workshop of solar physics and space weather by using their own data. Such capacity-building activities are surely promoting and spreading solar physics and space weather researches throughout the world. The second example is the MAGnetic Data Acquisition System (MAGDAS) Project conducted by Space Environment Research Center (SERC), Kyushu University. SERC has deployed the MAGDAS at 54 stations along the 210- and 96-degree magnetic meridians (MM) and the magnetic Dip equator, and three FM-CW radars along the 210o MM during 2005-2010 (see <http://magdas.serc.kyushu-u.ac.jp/> and <http://magdas2.serc.kyushu-u.ac.jp/>). The goal of MAGDAS Project is to become the most comprehensive ground-based monitoring system of the earth's magnetic field. By analyzing these new MAGDAS data, we can perform a real-time monitoring and modeling of the ambient plasma mass density and the global current system (e.g. Sq, EEJ) for understanding the plasma and electromagnetic environment changes in geospace and lithosphere during helio-magnetospheric storms. The first MAGDAS school was organized on November 8-9, 2010, Egypt, where 31 persons (mainly MAGDAS hosts from all over the world, but mostly from Africa) delivered 20-minute talks. The general theme of the MAGDAS school is Capacity Building, which consists of three phases: (a) development of instrument capacity, (b) development of data analysis capacity and (c) development of science capacity. Capacity Building is one of the major goals of the IHY/ISWI. Because of MAGDAS hosts, the Space Environment Research Center is able to successfully operate ground observatories all over the world.



PEM006-17

Room:101

Time:May 25 17:00-17:15

## A new muon observation using the SciBar detector in Mexico I: Performance evaluation with a proto-type detector

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We plan to fill a gap existing in viewing directions of the Global Muon Detector Network (GMDN) by adding a new detector at Sierra Negra, a high altitude (4600 m a.s.l.) mountain in Mexico. The detector will be installed primarily for observing solar neutrons, but we plan to use it also as a muon detector. The detector (SciBar) consisting of ~15000 scintillator strips (2.5x1.3 x 300 cm<sup>3</sup> each) viewed by ~250 multi-anode photomultipliers is capable for precisely measuring particles produced by various interactions of the primary cosmic rays with the atmospheric nuclei. The detector forms about 130 vertical layers of scintillator strips which are aligned in X or Y direction in each layer alternatively. In order to keep the dead time due to the muon measurement as small as possible, we plan to trigger the muon detection with the 4-fold coincidence between 4 layers forming the top and bottom X-Y pairs and identify the muon incident direction from X-Y positions in the top and bottom pairs. In this paper, we evaluate the performance of this new muon detector based on the preliminary experiment carried out with a small proto-type detector at Sierra Negra. We also demonstrate performances of this new detector in observing the space weather as an important component of the GMDN.

Keywords: global muon detector network, space weather, galactic cosmic rays

PEM006-18

Room:101

Time:May 25 17:15-17:30

## Equatorial Electrodynamics in the Asian Sector During the 2009 Stratospheric Sudden Warming

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Using observations of the TEC, NmF2 and EEJ from the ground network in south-east asia, the Equatorial Ionization Anomaly (EIA) and related electrodynamics in this longitude sector are examined during the period of stratospheric sudden warming in January 2009. Plasma density and neutral density from the CHAMP satellite are also employed to investigate the neutral background and possible longitudinal variability. The analysis reveals the following features. 1. The EIA indicated by both the TEC and NmF2 was seen to experience a semi-diurnal perturbation, with strong enhancement around 09 LT and significant weakening in the afternoon around 15 LT. This perturbation was consistent with that seen in the EEJ with strong counter electrojet developed in the afternoon during the same period. 2. Strong hemispheric asymmetry occur in the afternoon sector, with the plasma depletion in the northern EIA crest being 3 times of that in the southern crest. 3. Significant longitudinal difference was observed in the plasma density variation around 15 LT, with stronger depletion in the American sector than in the Asian sector. 4. Neutral density around 350 km was found to decrease by about 30% in the equatorial region, indicating overall cooling effects in the equatorial region associated with the warming in the polar region. It also demonstrates that the plasma density response in the EIA region may likely evolve chemical changes in the neutral background, in addition to electrodynamical processes.

Keywords: equatorial electrodynamics, equatorial electrojet, stratospheric warming, neutral-plasma interaction

PEM006-19

Room:101

Time:May 25 17:30-17:45

## SuperDARN Hokkaido radar: present status and future perspectives

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Super Dual Auroral Radar Network (SuperDARN) is a powerful tool for studying magnetosphere-ionosphere-thermosphere coupling with various spatial temporal scales. Recent deployment of mid-latitude SuperDARN radars such as Wallops, Hokkaido, Blackstone, Kansas East / West, Falkland Islands and Oregon East / West has made it possible to study a great variety of processes at subauroral and mid latitudes as well as auroral latitudes. In this paper we will present overview of the SuperDARN Hokkaido radar, which is the 2nd mid-latitude SuperDARN radar and the only one in the Asian region. The SuperDARN Hokkaido radar began operation in November 2006, and has been working for more than 4 years. In the presentation we will show main scientific results using the radar, ranging from the magnetosphere, ionosphere to the thermosphere and upper mesosphere at mid- and

subauroral latitudes. We will also present future perspectives, including plans of building a new radar in Hokkaido, covering the region to the west of the present Hokkaido radar FOV and adjacent to FOVs of Russian SuperDARN radars recently funded.

**Keywords:** SuperDARN, Hokkaido HF radar, mid-latitude ionosphere, inner magnetosphere, international collaboration, dynamics of geospace

PEM006-20

Room:101

Time:May 25 17:45-18:00


## Report of the STEL optical observation at the Tromsø EISCAT radar site by March 2011

Shin-ichiro Oyama<sup>1\*</sup>, Satonori Nozawa<sup>1</sup>, Ryoichi Fujii<sup>1</sup>, Kazuo Shiokawa<sup>1</sup>, Yuichi Otsuka<sup>1</sup>, Takuo Tsuda<sup>1</sup>

<sup>1</sup>Solar-Terrestrial Environment Laboratory

Solar-Terrestrial Environment Laboratory (STEL) has operated various kinds of optical instruments for more than 10 years at the Tromsø EISCAT (European Incoherent Scatter) radar site in Norway (69.6°N, 19.2°E), which is one of the state-of-art observatories at high latitudes. Five instruments are now in automatic operation regularly from October to March: (1) four-wavelength photometer (427.8 nm, 630.0 nm, 557.7 nm, and 844.6 nm), which is fixed to look along the magnetic field line, (2) digital camera for monitoring the weather condition and the auroral morphology, (3) proton all-sky camera (486.1 nm), (4) multi-wavelength all-sky camera (557.7 nm, 630.0 nm, OH band, 589.3 nm, 572.5 nm, and 732.0 nm), and (5) Fabry-Perot interferometer (557.7 nm, 630.0 nm, and 732.0 nm). While these instruments are programmatically operated, they have contributed to many campaign observations with the EISCAT radars, rockets, satellites, and other ground-based instruments. The quick looks are available on the web at [www.stelab.nagoya-u.ac.jp/~eiscat/data/EISCAT.html](http://www.stelab.nagoya-u.ac.jp/~eiscat/data/EISCAT.html). This paper reports activity of the optical instruments including the data archive and notable events during some Japanese special programs of the EISCAT radar.


<http://www.stelab.nagoya-u.ac.jp/~eiscat/data/EISCAT.html>



### EISCAT Database

Solar-Terrestrial Environment Laboratory, Nagoya University, Japan.

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What's New

- ▶ 2010/09/04 [Radar DATA] available DELTA-2 campaign data
- ▶ 2010/09/04 [Radar DATA] available IPU (CP2) data
- ▶ 2010/06/10 [Optical DATA] available statistics of the weather
- ▶ 2009/09/01 [DATA] Archive of the EISCAT data during the DELTA-2

**00220**  
since June 7, 2010

If you have any questions or comments on DATA, please contact:  
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Keywords: aurora, airglow, optical instrument, ionosphere, thermosphere, high latitude

PEM006-21

Room:101

Time:May 25 18:00-18:15

## Cosmic noise absorption at Kakioka and Brazil by using imaging riometer during quiet period

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<sup>1</sup>Takushoku University, <sup>2</sup>National Institute of Polar Research

During geomagnetic very quiet period(1 day Sum Kp < 4), cosmic noise absorption(CNA) are sometimes observed at Brazilian geomagnetic anomaly region. We compared such CNA events with imaging riometer (IRIS) data at Kakioka, Japan. It was found that similar CNA events are observed at both places with time lag about +,-12hrs. CNA shows stripe structure similar to Traveling Ionosphere disturbance (TID). We also examined low altitude NOAA particle data. But there is no clear particle precipitation in this time.

These CNA are observed around 9h or 21h local time. If the CNA source region are stably exist during more than 10hours in both hemispheres, similar CNA at two points will be observed. However, we do not know what kind of such stable source is. We will check again IRIS data/analysis method and also examine possible stable source.

Keywords: cosmic noise absorption, imaging riometer, geomagnetic anomaly

# Japan Geoscience Union Meeting 2011

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PEM006-22

Room:101

Time:May 25 18:15-18:30

## NICT's Space Weather Observation Networks -Next 5 Years-

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<sup>1</sup>NICT

We are operating space weather monitoring networks (NICT-SWM) as a research project for measurements of solar-terrestrial environment and space weather prediction. The magnetometer and HF radar networks are running in the arctic region and Japanese meridional sector for monitoring energy flow from the magnetosphere to the polar ionosphere, and propagation of disturbances from the polar to the equator. Solar and solar wind activity, and ionospheric activity over Japan is monitored by domestic ground-based observatories and satellite data receiving facilities. Equatorial ionospheric disturbances are observed by South East Low Latitude Ionosonde Network (SEALION). From April 2011, NICT newly start the 3rd medium-term plan. In this period, our capabilities of space weather monitoring will be expanded based on the international collaborations around Asia-Oceania region. We plan to construct an early warning system of equatorial plasma bubbles, and plan to construct a prediction model of space environment around geosynchronous orbit based on the collaborations with simulations and informatics. We will introduce current status and next 5 years perspective of NICT's space weather monitoring networks.